

PRIMARY SARCOMA OF THE SPLEEN, AND ITS TREATMENT BY SPLENECTOMY.

BY WILLIAM JEPSON, M.D., F.R.C.S. (ED.),

OF SIOUX CITY, IOWA,

Professor of Surgery in the State University of Iowa,

AND

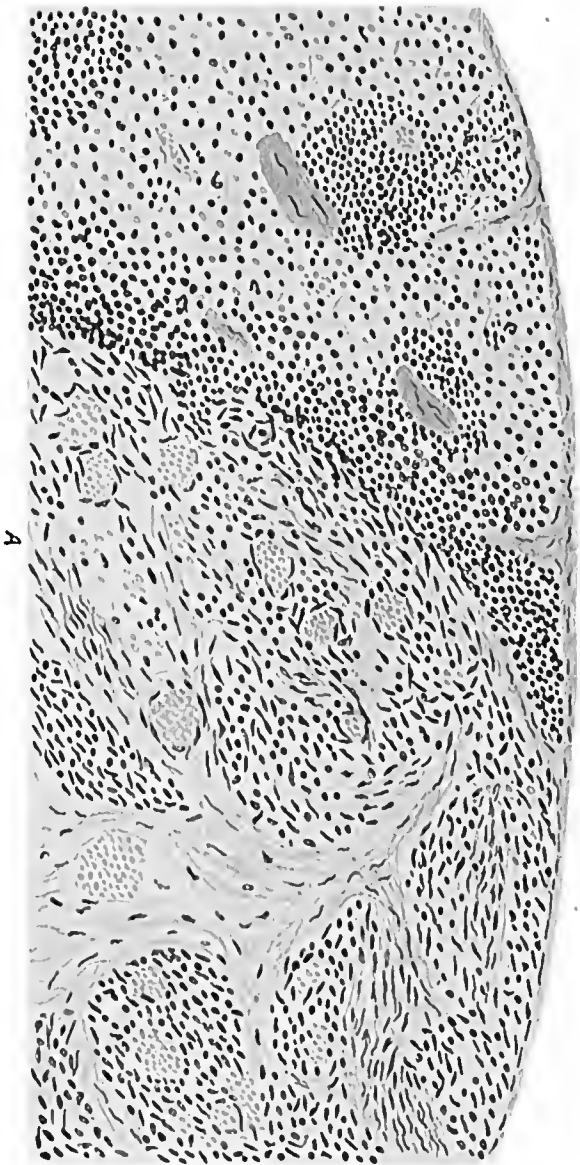
FREDERICK ALBERT, M.S., M.D.,

Professor of Pathology, State University of Iowa.

BELIEVING that the advancement in any field of science must result largely from the accumulated experience of the workers in that field, leads us to present the clinical history and pathological findings of a case of fibrosarcoma of the spleen.

Miss O. S., of Keosauqua, Iowa, entered the University Hospital, May 13, 1903, at the request of her physician, Clarence C. Heald, giving the following history: Age, fifteen years; her family history, as well as her past history, was negative so far as having any bearing upon her present condition. She had never suffered from malaria, any septic process or any injury, that she had any knowledge of. In fact, she had considered herself well until the early manifestations of her present trouble, which consisted in the appearance, about five months previous, of an enlargement in the left hypochondriac region, particularly noticeable upon standing or lying upon her right side. The growth had been gradually increasing in size. It caused her no particular discomfort, aside from a slight dragging sensation after walking about for some time, and the knowledge that there was something wrong as manifested by the presence of the mass which she could feel in the abdomen.

Her general appearance was that of a person possessed of good health and well nourished. Physical examination of the various organs of the economy gave no evidence of the existence of any abnormality, excepting the spleen, which was in question.



A. Section through a portion of spleen and tumor; stained by hematoxylin and eosin. Magnification, 300. 1. Border line between tumor substance and splenic tissue. Section through tumor shows large amount of fibrous connective tissue, also poorly formed blood-vessels and round and spindle cells of the sarcomatous process.

No evidence was obtainable indicating that any organ was performing its functions imperfectly.

Urinalysis negative. The same may also be said as regards the blood examination.

Physical Examination.—Inspection of the abdomen, while the patient was lying upon her back, revealed nothing abnormal excepting a slight fulness of the left hypochondriac region. Upon changing her position to the right side, or in standing, the mass was found to descend downward, forward, and inward to the extent that its lower border was about two inches below the umbilicus, seemingly hugging the anterior abdominal wall. The growth, upon the patient assuming the dorsal posture, would recede to the left hypochondriac region. It was not influenced by diaphragmatic movement. Percussion of the colon, with a view to determining its relationship to the growth, when the same was displaced downward, led to some question as to whether the growth was of splenic or renal origin, as the colon was found to pass over the lower part of the growth. Upon palpation, the mass was found to be an elongated one, in the upper half of which the more or less sharply defined edges, indicative of splenic structure, could be fairly well made out; while the lower half of the mass seemed to be more or less lobulated, very dense, and indistinctly merging with the upper portion of the growth. No splenic fissure could be made out. A diagnosis of a solid growth of the spleen was made.

On May 19, 1903, the patient was operated upon through an incision made along the outer border of the left rectus muscle, having its origin an inch below the costal cartilages and terminating about two inches below the level of the umbilicus. This was joined at right angles by another incision about three inches long, running out into the iliocostal space. Before the peritoneum was opened, the purple-colored spleen was already recognized. The spleen was easily brought forward through the wound, and ligation of its pedicle, consisting of the gastro-lienale ligament, in which coursed all the splenic vessels but one, was readily accomplished by double ligation before the spleen was removed. The mesocolon, having been dissected up by the spleen, was opened through its outer border, which was subsequently closed. Owing to the slight oozing from this area, a stab wound in the iliocostal space at the outer border of the kidney was made, into which a

cigarette drain was introduced, which was removed on the second day.

Recovery uneventful. She left the hospital on the twenty-fourth day.

Present Condition.—On December 22, 1903, upon request, she presented herself at the hospital and the case was carefully gone over. Her general appearance was that of a person in good health. She expressed herself as having been in perfect health since her return home. Menstruation has been normal the past five months.

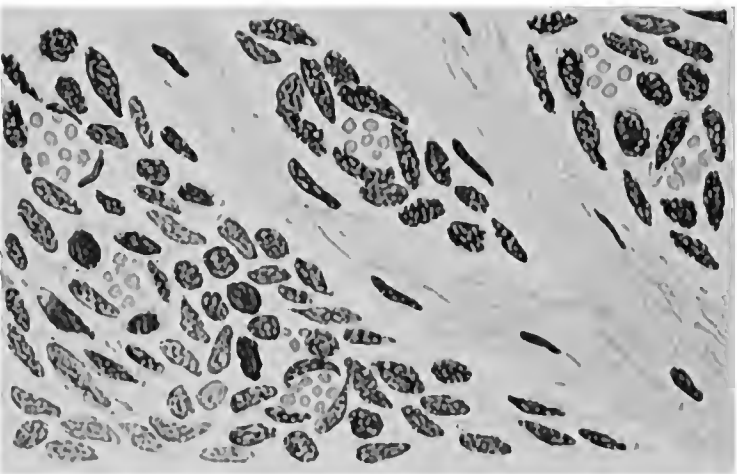
Examination of the various organs was negative. Abdomen palpable without pain or undue rigidity. The region occupied by the spleen, as well as the contiguous structures, were free from induration, the liver seemingly normal.

Blood Examination.—A blood examination was made two days prior to the operation and at intervals of two to three days following the operation. The patient was quite anæmic and had a moderate leucocytosis before operation. After the operation, the red corpuscle count fell for several days, then gradually the number increased. A marked leucocytosis was present immediately after the operation, which continued as long as the examinations were made. The amount of hæmoglobin varied in proportion to the number of red corpuscles.

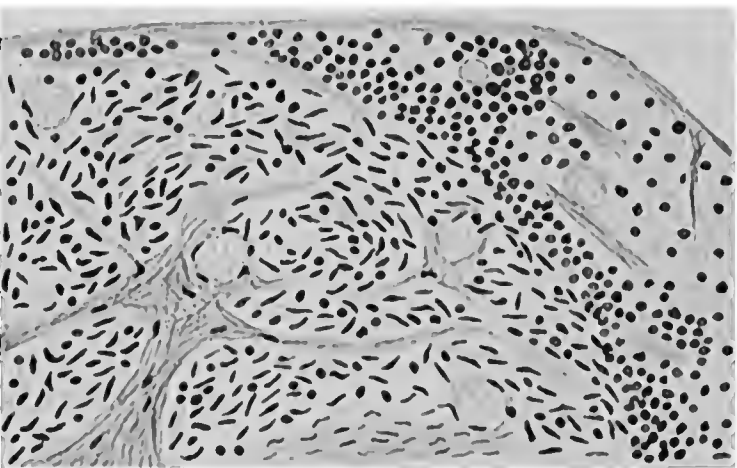
Some poikilocytes, microcytes, macrocytes, and nucleated red corpuscles appeared, especially after the operation.

BLOOD EXAMINATIONS.

Time of Examination.	Number of Red Corpuscles per Centimetre.	Number of White Corpuscles.	Per Cent. of Hæmoglobin
Two days before operation.....	5,260,000	6,120	72
One day after operation.....	3,346,000	22,200	64
Three days after operation.....	3,116,000	24,500	58
Five days after operation.....	3,320,000	16,200	62
Nine days after operation.....	3,810,000	23,400	62
Thirteen days after operation....	4,360,000	27,000	61
Seventeen days after operation....	4,330,000	24,560	60
Twenty-one days after operation...	4,320,000	23,120	62
Twenty-four days after operation..	4,336,000	23,220	63
December 22, 1903, the seventh month after	4,420,000	10,810	84



B



C.

B. Section through a portion of the tumor. X 1200. Stained by hematoxylin and eosin.
C. Section through a portion of spleen and tumor. X 450. Stained by Van Gieson's method; connective tissue is stained red. r. Border line between splenic tissue (above) and tumor substance (below).

The entire specimen, consisting of spleen and tumor mass, is 17.2-4 centimetres long, and varies in width and thickness at different places, as will be described later. It weighs 256 grams, about one-fourth of which represents the weight of the spleen, the remainder the weight of the tumor. The tumor is attached to and apparently occupies the lower portion of the spleen. It is quite well encapsulated. The capsule of the tumor and the line of demarcation between the spleen and tumor are not easily distinguishable, so that the tumor mass appears to be continuous with the splenic substance.

The tumor is rather spherical in general outline and has a circumference of $23\frac{1}{2}$ centimetres. The surface of the tumor presents a rather nodular appearance, which is most marked along the lower and external surfaces. The mass is quite hard and firm, considerably more so than the spleen, and is of a dark purple red color, a color practically the same as that of the external surface of the spleen.

The specimen was cut in such a way that the incision extended along the middle of the external or phrenic surface of the spleen, and then continued through the tumor mass. The cut surface of the tumor area is of a bright red color, quite uniform over the entire surface, but here and there are found dense bands of tissue of a white color with a slight tinge of blue. The dense bands are at certain places four millimetres wide, at other places they appear as delicate threads. Some of them appear to be sharply defined from the surrounding red-colored tissue; others seem to diffuse gradually into the surrounding substance. The dense fibrous tissue is rather irregularly distributed, and it is the contraction of this tissue that accounts for the place on the external surface which produced a depression about one centimetre deep. The upper portion of the tumor fits into a concavity made by the base of the spleen. The upper border of the tumor is readily recognized and easily distinguished from the splenic substance by the bright red color of the former as compared with the yellowish brown color of the latter. At one place, however, the border line is not so readily noted. It appears as if there has been a slight interchange of splenic and tumor substance. Although apparently well circumscribed, a distinct connective-tissue capsule is recognizable only at the periphery, where a small strip which is connected with the capsule covering the spleen and tumor externally extends in-

ward between the spleen and tumor for about one-half centimetre on all sides. The tumor is nine and three-fourths centimetres long, eight and one-fourth centimetres wide, and seven and three-fourths centimetres thick.

The spleen itself appears to be but little affected. It has a pyramidal form, the base in contact with the tumor. The base is, however, not represented by a flat surface, but has considerable of a concavity which lodges the upper portion of the tumor mass. At the base the spleen is seven centimetres wide and four centimetres thick. The apex comes to a quite sharp point. The external or phrenic surface presents a normal convexity and is seven centimetres long. The intermediate ridge separating the gastric from the renal surfaces is quite well marked and is seven centimetres in length. The gastric surface is flat and only three and one-half centimetres wide at the base. The anterior margin is eleven centimetres long and contains no notches. The posterior border is more blunt and is only eight centimetres long. The hilum is located on the gastric surface, beginning six and one-half centimetres below the apex of the spleen, at first adjacent to the intermediate ridge, then extending outward and downward towards the anterior border, terminating at a point between the spleen and the tumor, two centimetres from the anterior border of the spleen. The ligaments constituting the pedicle of the spleen have an attachment extending from above the hilum downward, covering the internal surface of the tumor for two and one-fourth centimetres. The vessels passing into and coming from the organ enter the spleen directly through the hilum, with the exception of two, which enter the substance of the tumor. The spleen has a normal, dark purplish-red color and is normal in consistency.

The size of the spleen as compared with the size of the patient seems to indicate that there has been but little, if any, destruction of splenic substance.

On microscopic examination it is found that different portions of the tumor present different conditions. In most places there is found a dense field of cells, some of which are round, but the majority are spindle shaped. Most of the cells have a large nucleus rich in chromatin and surrounded by a small amount of cytoplasm, in others the cytoplasm is large in amount. Between some of the cells there is found the distinct elements of fibrous connective tissue. The dense white areas noted above

are made up of an almost homogeneous fibrillar connective tissue containing only a few nuclei.

The blood-vessels of the tumor are very poorly formed, most of them lined simply by endothelial cells or by the tumor cells themselves. In certain places, a number of red corpuscles are seen lying free between the tumor cells. A section through the specimen at the place where the tumor borders on the splenic substance reveals the absence of a distinct capsule. The border-line between the two structures can, however, be fairly well determined. The splenic tissue lying adjacent to the tumor substance consists of normal splenic elements very closely crowded together, even more so than are the cells of the Malpighian corpuscles. In this dense splenic tissue, which is from one-fourth to one-half centimetre wide, no blood-vessels were found, and only here and there an occasional red corpuscle, so that this tissue can really be considered as a limiting membrane, preventing any rapid spread of the tumor into the substance of the spleen proper. The splenic tissue elsewhere appears to be normal.

That the spleen is not an organ essential to the maintenance of a fair degree of health has had abundant proof through the numerous splenectomies of the past half-century. Thus, of the 274 cases of extirpation of the spleen which it was possible for Van Verto to report in 1897, 170 recovered, while the 360 cases collected by Hagan in 1900 give a mortality of only 38.3 per cent.; and we have no doubt that were statistics obtainable to the present time, an equally good, if not a much better, showing could be made. The result is that the spleen is being rapidly forced into that large list of organs which are being subjected to operative procedure on the part of surgeons. Of these procedures, splenectomy has won for itself a fixed place, and must henceforth be looked upon as a rational means of treatment in certain pathologic conditions of the spleen. Yet, when we come to a consideration of what these conditions are which shall form such indication, we realize that much remains to be done in this direction, and in no particular class of cases is this more evident than in the treatment of neoplasms of this organ. The paucity of accumu-

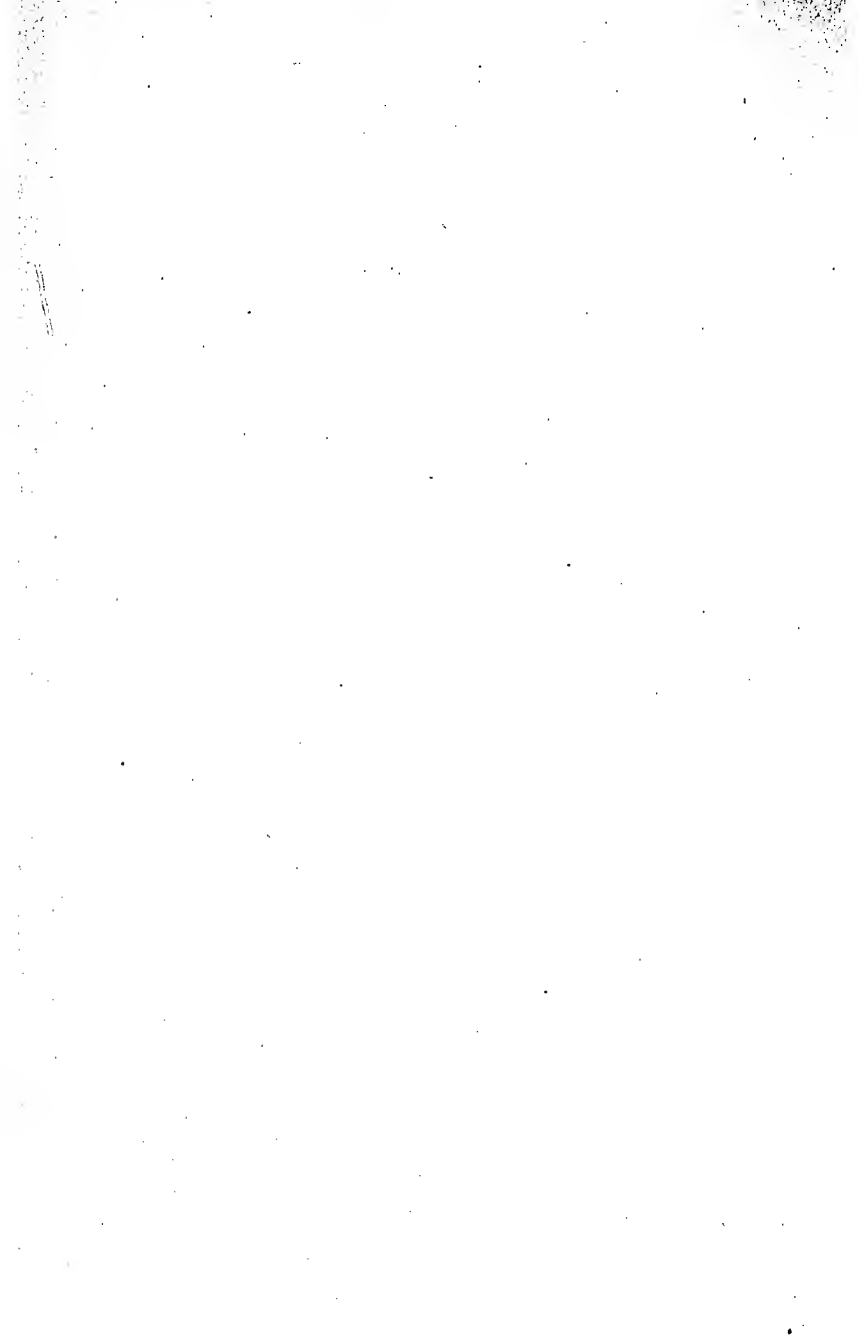
lated experience of the profession may be considered as responsible for this to a large extent.

It has long been recognized as a fact that the spleen is possessed of a relative immunity to secondary involvement by new growths, while the existence of malignant neoplasms having their origin primarily in this organ has been so infrequently observed that some doubt has been expressed as to their existence. Litten, in Nothnagel's Series, Vol. viii, 1898, states that "Primary sarcoma of the spleen is very rare." Mosler, in his work upon "Diseases of the Spleen," in 1875, knew of no case, and B. Grohe, in "Virchow's *Archives*," in 1897, writes as follows: "Tumors of the spleen recognizable during health occur very seldom. Of heteroplastic tumors of the spleen, only a few cases are known. Primary sarcoma appears more than doubtful, while primary sarcoma of the spleen is extremely rare."

Weichselbaum was the first to report any cases of primary sarcoma, if we exclude the case reported by Friedreich in 1865, under the title of "Multiple Nodular Hyperplasia of the Liver and Spleen," which Bunting, however, believes to have been a primary sarcoma of the spleen. Weichselbaum (Virchow's *Archives*, 1881) states that until that time there existed no records of any cases in medical literature. He then proceeds to report two cases. Since that time there may be found scattered through medical literature reports of a fair number of cases, which have been recorded as primary malignant neoplasms of the spleen. We herewith append a list of those so far recorded. The total number which we have been able to gather from various sources is thirty-two, including the one here reported. It will be understood that much doubt must exist as to whether all of the cases included in this number rightfully belong there, as some of the cases were recorded as such without having their true nature determined by careful microscopic examination of the specimen. And in some of the cases the clinical history and gross findings are at variance with our present conception of primary neoplasms, as will be pointed out later in dealing with the operative cases.



Sarcoma of spleen, gross specimen.



Of the above thirty-two cases, twelve were subjected to operative interference, eleven to splenectomy, and one to enucleation of the growth. The latter case was that of Heinrich, in which instance there no doubt existed a pedunculated primary fibrosarcoma of the spleen, developing from its capsule, which at the time of the operation was looked upon as a benign growth, and was consequently subjected to enucleation, with the result that probably a portion of the growth remained through which recurrence took place. It was only after a microscopic examination of the growth was made that it was found to be a fibrosarcoma with myxomatous degeneration. Heinrich expresses himself as follows regarding this case: "Had I known at the time of the operation that the growth was malignant, it would have been more proper to have extirpated the spleen, although the organ itself appeared, and evidently at the time was, normal." Case died seven days after the operation.

Of the eleven splenectomies, three died following the operation, namely, the cases of Flothmann, Collins, and Krylow.

The case of Flothmann was that of a man aged forty-four years, cachectic, possessed of a four-pound splenic growth, which was adherent upon all sides to adjacent structure. At the termination of the operation there was observed in the omentum the existence of a tumor about the size of a man's fist. Its removal was also undertaken. Death followed fifty hours later from acute anæmia. The spleen was studded throughout with innumerable small growths, some as large as a hazel-nut. As this case presents a picture somewhat typical of metastasis to the spleen, it is believed there exists some reason for excluding it from among primary sarcomas of the spleen.

The case of Collins was that of a male, aged thirty-six years, who had suffered severely from malaria ten years previously while a soldier in the English army in India, since which he had, however, been apparently well until two months prior to the operation, at which time he noticed a growth in the left side, which was increasing in size and at times was painful. He had lost fifteen pounds in weight in these months. No other symptoms existed. Blood examination revealed white corpuscles, 5000; hæmoglobin, 60 per cent. At the operation, January 11, 1900, the spleen was found to be extensively adherent to surrounding structures. A portion of the pancreas was removed with the growth. A portion of the spleen not affected by the growth was allowed to remain attached to the

cardiac end of the stomach. Death followed on the sixth day, due to acute general peritonitis, pleuritis, and streptococcus septicæmia. Growth consisted of a small round-cell sarcoma about the size of two fists, and a sarcomatous mass size of palm of hand, with some pancreatic tissue and a small supernumerary spleen about the size of a walnut.

In the case of Krylow, which we quote from Simon, he having quoted the same from Hildebrand's *Jahresberichte*. "Splenectomy was undertaken in a patient fifty-one years old, much emaciated. Much hæmorrhage resulted from the operation, the patient dying four hours later. The tumor was reported to be a sarcoma, weighing eight and one-half pounds, which had existed for three years." The remaining eight cases which recovered from the immediate effects of the operation are as follows:

Case of Billroth (reported by Von Hacker). Patient, female, aged forty-three years. Tumor and spleen of large size, weighing 1450 grams. Tumor was smooth in front, but possessed of a protuberance posteriorly. Lower border divided by three fissures. The tumor was quite painful on pressure, which pain was reflected to left shoulder. The same was diagnosed by Billroth prior to operation as a sarcoma. The spleen was removed; it being the first case of splenectomy for sarcoma. The tail of the pancreas was found adherent to the tumor growth, seven centimetres of which were removed. The tumor was seventy-five centimetres in circumference, twenty-five centimetres in length, and eighteen centimetres in width. Microscopic examination showed it to be a lymphosarcoma. The growth had probably existed over ten years, as for that length of time at least there had been observed a marked fulness in the upper left quadrant of the abdomen, and for seven years there had existed two growths of a size sufficient to be palpable. The last two years were marked by rapidly increasing growth. Three weeks subsequent to the operation there existed a slight leucocytosis. The patient died six months later from recurrence.

Jordan's case was that of a patient, fifteen years of age, who in June, 1895, was subjected to an operation by him for the removal of an enlarged lymph node about the size of an egg, from the submaxillary region of the left side, which microscopic examination seemed to indicate as being a lymphosarcoma. Some time later the patient began suffering very severely from pain in the splenic region, and in August, 1896, the spleen was removed. It was found to be the seat of a sarcoma with metastases in the structure of the hilum. The patient is supposed to have died of recurrence. May it not be that this case should be expunged from the list of primary sarcomas of the spleen, owing to the fact that it may have been secondary to the sarcomatous lymph node previously removed?

In the case operated upon by Professor Kocher, no definite history is possessed as regards the case, excepting that the spleen was the seat of a lymphosarcoma with many regional metastases involving the liver and mesenteric lymph nodes. It was considered by Vulpis, Braun, Litton, and



Sarcoma of spleen, gross specimen. Section through tumor.



others as a primary sarcoma of the spleen. Simon, however, has raised the question as to whether the patient did not suffer from a generalized lymphosarcoma, in which process the spleen became secondarily involved.

As regards the case of Herczel, we again quote from Simon, who quotes the same from Hildebrand's *Jahresberichte*.

The case was that of a fourteen-year-old boy, in which a growth had been noticed for one week. The extirpated spleen measured twenty-five by nineteen centimetres, and weighed 2456 grains. Within the otherwise perfectly normal spleen, there existed what was considered a primary sarcoma of the spleen about the size of an apple. Following the operation there existed a marked leucocytosis, the patient recovering, but as regards subsequent history nothing is known.

The case of Friteli was that of a woman aged thirty-one years, multipara, who had since March, 1887, suffered with severe pain in the region of the spleen, at which time a small tumor had also been observed in the hypochondriac region, which grew rapidly until June 24, 1887, at which time she was operated upon. Blood examination in this case was normal. The recovery was uneventful, and on the 24th of November the following year she gave birth to a still-born child. The woman died six and one-half years later of what was presumed to have been a cardiac lesion. No post-mortem was obtainable. The spleen was seemingly normal, excepting at one point upon its convex surface, where existed the growth in the splenic structure, which upon section seemed to be well circumscribed, although not sharply so, from splenic structure.

Wagner's case was that of a woman aged twenty-seven years, multipara, last confinement, which was followed by normal puerperium of two weeks' duration, preceded the operation by seven weeks. The growth, which was readily movable, and about the size of a child's head, was first noticed after her getting up from her confinement. The palpable surface of the tumor seemed more or less smooth, of about the consistency of the liver. Microscopic examination of the blood showed a normal relationship between the reds and whites and the normal quantity. The patient was operated upon November 30, 1893. Recovery uneventful. In April, 1894, her condition was excellent. Van Verts reports her in 1897, which is three years later, as in good condition. The spleen and tumor weighed 1285 grams, and measured $19 \times 9\frac{1}{2} \times 10$ centimetres.

Garre's case, reported by Simon, was that of a woman thirty-eight years of age, iv para, who since her first confinement, eleven years previously, had suffered some distress in the gastric region. When about five months advanced in last pregnancy, she began to suffer much from pains in left hypochondriac region, which, however, subsided in the course of a short time. Normal confinement. In about five months there was a recurrence of the pain in the left hypochondriac region, though not severe.

The general condition of the patient at this time was that of one being in fair health. Urine normal. Blood; reds, 4,310,000; whites, 5000 per centimetre. Growth felt in left hypochondriac region. Diagnosed as sarcoma of spleen. Splenectomy. Recovery uneventful. Blood count, post-operative: second day, reds, 2,350,000; whites, 8600. Seventh day, reds, 3,600,000; whites, 7800. Thirtieth day, reds, 4,100,000; whites, 7000. A hæmoglobin, 50 and 60 per cent. Spleen measured $22 \times 13.5 \times 11$ centimetres, and weighed 1750 grams. Microscopically, growth shown to be a round-celled sarcoma. Reported free from recurrence at the end of four months.

Of the eight cases that survived the immediate effects of the extirpation of the spleen, three cases have died of recurrence (Billroth, Jordan, and Kocher), and regarding one (that of Herczel) there exists no data which can be utilized in determining freedom from recurrence. Of the four remaining, two at least may be said to have been free from recurrence, namely, the case of Fritch, living six and one-half years, and Wagner's case being well at the end of four years. In the remaining two cases, namely, Garre's and the one here reported, it cannot be said that a sufficient time has elapsed since the operations to eliminate the possibility of recurrence; yet, the fact that the first was, after careful examination at the end of four months and the latter at the end of ten months, found to be possessed of good health, without any discernible evidence of recurrence, entitles one to the belief that freedom from recurrence may be the result. If this be true, primary sarcoma of the spleen may be looked upon as highly amenable to a cure through splenectomy, for, from the foregoing list of cases operated upon, we should, in trying to determine the amenability of the spleen to operative interference, in the case of malignant growths, exclude all cases where the same have given rise to metastasis or is under the suspicion of having been secondarily involved. Such would be a contra-indication in any organ or tissue of the body. The three cases in which recurrence took place fall in this class.

It is quite possible that future experience may show that it will be necessary to further take into consideration, when determining the amenability of the sarcomatous spleen to

extirpation, the tissues from which the same arises. Thus the spleen offers three types of connective tissue from which it may originate. First, the capsule and trabecula; second, lymphoid structure, and, third, the endothelial cells, which give rise respectively to the fibrosarcomata, lymphosarcomata, and endothelial sarcoma.

Diagnosis.—A diagnosis at an early stage, before the occurrence of metastases, is of course an essential in the treatment of malignant growths here as elsewhere in the economy.

The early recognition of malignant growths of the spleen presents some real difficulties, on account of the meagre symptoms, which result from its presence. We could only expect the presence of three symptoms, namely, 1. Enlargement of the spleen. 2. Pain. 3. Blood changes.

1. The first symptom, namely, enlargement, must be difficult of recognition in the early stage, owing to the protected position of the spleen making palpation impossible, while percussion is not to be relied upon. Owing to the only moderate support which the spleen has through the reflections of the peritoneum, it seems that the increased weight soon lengthens these attachments, with the result that the spleen at an early period acquires a range of mobility making it possible for it to descend below the costal margin, where it may become palpable, thus giving us the most trustworthy evidence possible of attainment in the light of our present knowledge of the subject. It having been determined that the growth pertains to the spleen, the nature of the enlargement will present itself for solution. The physical characteristics of the growth will largely aid in this. Thus, if the spleen is uniformly enlarged, with its normal shape well maintained, it would be a justification for excluding all primary neoplasms, at least in the early stage of their formation. While if, on the other hand, the spleen is not uniformly enlarged, but the seat of nodosities, or localized enlargement, it would bring up for review those various conditions capable of bringing this about. If it is possible to determine by palpation or aspiration (this latter means of diagnosis is probably not so safe as that of explora-

tion in capable hands) that the enlargement is cystic, then, of course, there is excluded echinococcus and other cysts as well as abscess of the spleen. The growth being a solid one, the question of its being a sarcoma, fibroma, angioma, or lymphangioma appears for solution; and this must certainly be at times quite impossible until the growth is exposed to inspection by an exploratory incision; although, in the instance of Billroth and Garre's, it is said that a diagnosis was made prior to operation. Theoretically, we would expect rapid growth, yet a review of the cases does not show this to be always so. This phenomenon has had much stress laid upon it as a symptom by Ledderhose, Litten, Braun, Krause, and others; but it must often fail in being of real value, owing to the fact that it must be very difficult to determine this in many instances; and if malignancy is suspected, it would seem unwarrantable to defer treatment until the rapidity of growth could be definitely determined.

2. Pain. Considerable pain would be expected to exist, owing to the distention of the splenic capsule; yet this does not seem to be a symptom of much value, as it is often absent, and if present, a misinterpretation of its significance must often occur, owing to the proximity of this organ to the stomach and left kidney.

3. Blood examination seems to be of no real value from a diagnostic stand-point as revealed by the results of those undertaken in the cases so far reported.

An analysis of the symptomatology of primary sarcoma leads to the belief that the diagnosis must, for the present at least, be largely based upon the recognition of the existence of a solid growth in the spleen, and that a definite diagnosis cannot be made until the spleen is exposed through an exploratory incision, which, it seems to us, would always be indicated where doubts exist.

Treatment. As to treatment, no question can exist as to the advisability, in the absence of secondary involvement of other organs, of removing the spleen, which in the hands of the experienced surgeon must be associated with but a small

mortality; and it is believed that the results of the work so far undertaken are such as to justify the hope that a very large per cent. of primary sarcomas of the spleen will be proven susceptible of a radical cure.

BIBLIOGRAPHY.

- Asch. Arch. f. Gynäkol., 1888, p. 130; Centralbl. f. Gynäkol., 1898, Nr. 52.
 Baccelli. De primitivo splenis carcinomate, Rom., 1876.
 Birch-Hirschfeld. Lehrbuch der Path. Anat., Fourth Edition, 1894, Vol. ii, p. 218.
 Bovaird. American Journal of the Medical Sciences, 1900, Vol. cxx, p. 377.
 Braun. Handbuch der prakt. Medizin, 1900, Bd. ii.
 Bridges. Chicago Medical Journal, 1868, Vol. xxv, p. 729.
 Bunting. University of Pennsylvania Bulletin, 1903, Nos. 7 and 8, p. 318.
 Casott. Ein primäres Sarkom der Milz., Inaug. Diss., Würzburg, 1899.
 Clark. The British Medical Journal, 1883, Vol. i, p. 418.
 Collier. Transactions of the London Pathological Society, 1895, Vol. xli, p. 148.
 Dollinger. Deutsche Aerzte-Zeitung, 1902, p. 181.
 ✓ Fink. Zeitschrift für Heilkunde, 1885, Band vi, p. 399.
 ✓ Flothmann. Münchener medicin. Wochenschr., 1890, p. 867.
 Friedreich. Virchow's Archiv, 1865, Vol. xxxiii, p. 48.
 ✓ Fritsch. Quoted by Litten, Nothnagel's Spec. Path. u. Therapie, 1898, Vol. viii, Part iii, p. 221.
 Gaucher. De l'épithélioma primitif de la rate. Thèse de Paris, 1882.
 ✓ Grole. Virchow's Archiv, 1897, Vol. cl, p. 324.
 ✓ v. Haeker. Vern. der Deutschen Gesellsch. f. Chirurgie, 1884, Vol. xiii, Part i, p. 30.
 Hagen. Archiv für klinische Chirurgie, 1900, Band v, Heft 62, p. 188.
 Heinrichius. Centralbl. f. Chirurgie, 1898, Vol. xxv, p. 607.
 Herezel. Orvosi Hetilap, 1895, Nr. 50; Ref. Hildebrand's Jahresberichte, Band i, p. 879.
 Jordan. Verhandl. d. Gesellsch. deutscher Naturforscher und Aerzte, 1896, Teil ii, Hälfte ii, p. 152.
 Kehr. Handbuch der prakt. Chir., Band iii, 1.
 ✓ Kocher. Korrespondenzblatt f. Schweizer Aerzte, 1888, p. 649.
 Kraus. Handb. d. prakt. Medizin, 1900, Band ii.
 Krylow. Chirurgia, Juli, 1898, Ref. Hildebrand's Jahresberichte, Band iv, p. 764.
 Ledderhose. Deutsche Chirurgie, Band 45b, p. 171, 1890.
 Litten. Nothnagel, Spec. Path. u. Ther., Wien, 1898.
 Mayer. Beitrag zur Chirurgie der Milz, Inaug. Dissert., Greiswald, 1899.
 Mosler. Ziemssen's Handbuch der Spec. Path. u. Therapie, 1875, Vol. viii, Part ii, p. 139.
 Notta. Arch. Gen. de Med., 1886, Vol. xvii. Quoted by Litten.
 Parker. New Hampshire Journal of Medicine, 1850, Vol. i, p. 104.

Perry. Glasgow Medical Journal, 1869, Vol. i.

Picou et Ramond. Archives de méd. exper. et d'anat. path., 1896, Vol. viii, p. 168.

Schönborn. Handb. d. Ther. innerer Krankheiten, Band ii, p. 206, 1897.

Schönstädt. Inaug. Dissert., Würzb., 1891.

Simon. Beiträge zur klinischen Chirurgie, Band xxxv, Heft 2.

Trelat. Gazette des hôpitaux, 1872, pp. 453 u. 460.

Van Werts. De la splenectomie Thèse de Paris, 1897.

Vulpius. Beiträge zur klinische Chirurgie, 1895, p. 11.

Wagner. Verhandl. d. deutschen Gesellschaft f. Chir., Band xxiii, 1, p. 155, 1894.

Warren. ANNALS OF SURGERY, 1901, Vol. xxxiii, No. 5, p. 513.

✓ Weber, J. Ein Fall von primären Milzsarkom, Inaugural Dissertation, Erlangen, 1901.

Weichselbaum. Virchow's Archiv, 1861, Vol. lxxxv, p. 562.

Woodruff. Cincinnati and Western Journal of Medicine, 1867, Vol. ii, p. 471.

CASES REPORTED AS PRIMARY SARCOMA OF SPLEEN.

No.	Age.	Sex.	Reported by	Spleen.	Other Organs.	Symptom.	Classification of Growth.
1	56	M.	Friedreich, 1866.	Post-mortem specimen. Spleen seat of many small tumors, varying in size from those being just visible to the size of a pea. Spleen much enlarged, with nodular growths throughout its structure.	Liver was involved by similar growths.	.....	Primary endothelial sarcoma of spleen. So classified by Bunting.
2	21	M.	Weichselbaum, 1881.	Spleen much enlarged, with nodular growths throughout its structure.	.....	.....	Primary endothelial sarcoma. Birch-Hirschfeld classed it among the nodular hyperplasias.
3	21	M.	Weichselbaum.	Tumor arose in substance of spleen, from which it was easily separable, and projected above the convex surface.	No metastasis.	.....	Primary fibrosarcoma.
4	55	F.	J. Weber, 1901.	Tumor arose in substance of spleen, from which it was easily separable, and projected above the convex surface.	Metastasis in mesentery, omentum, and retroperitoneal lymph-nodes.	.....	Lymphosarcoma.
5	39	M.	Schönschadt, 1891.	.....	No metastasis.	.....	A mixed tumor, partly of the nature of a fibroma and partly endothelioma.
6	20	M.	Grobe, 1897.	28 by 13 by 18 centimetres. Permeated throughout by nodular growths, but small amount of splenic pulp.	It was adhered to diaphragm, stomach, and left lobe of liver.	History of a previous fall followed by pain in left side. Hemoglobin 70 per cent. Reds, 4,600,000; whites, 15,400. Had been incapacitated for labor before death by reason of pain and discomfort for a period of only sixteen days.	Lymphosarcoma. Birch-Hirschfeld believes it to have been a large hyperplasia.
7	49	M.	Bunting, 1903.	Spleen enlarged, weighing 250 grammes. Bulk of organ appears to be made up of grayish opaque tissue.	Metastasis to liver, pancreas, gastrohepatic lymph-nodes, and subcutaneous tissue.	.....	Primary endothelial sarcoma.
8	54	F.	Casott.	5000 grammes.	Metastasis throughout the abdomen.	.....	Primary round-celled sarcoma.
9	28	F.	Woodruff.	Pedunculated tumor arising from the spleen.	Metastasis liver, gall-bladder, and descending colon.	.....	Primary sarcoma.
10	13	M.	Baccelli, 1876.	Weight of spleen, 2400 grains.	.....	.....	Primary lymphosarcoma.
11	.....	.....	Trelat.	.....	.....	.....	Primary lymphosarcoma.
12	.....	.....	Picou.	.....	.....	.....	.....
13	.....	.....	Ramond.	.....	.....	.....	.....
14	.....	.....	Bovalard.	.....	.....	.....	.....
15	.....	.....	Moslier.	.....	.....	.....	.....
16	.....	.....	Parker.	.....	.....	.....	.....
17	.....	.....	Perry.	.....	.....	.....	.....
18	.....	.....	Bridges.	.....	.....	.....	.....
19	.....	.....	Clark.*	.....	.....	.....	.....
20	5	M.	Notte.	.....	.....	.....	.....

CASES REPORTED AS CARCINOMA OF SPLEEN.

With metastasis in liver and peritoneal cavity. As microscopic examination was made only in the last two, they should probably be classified either among the sarcomas or splenic aneurisms.

Case considered by Liton as a sarcoma of the kidney.

* A case reported by Clark as a congenital small round-celled sarcoma of abdomen, including in its growth the spleen and left testicle, and filling whole left side of abdomen, should probably be excluded, as origin of tumor was not definitely ascertained.

CASES SUBJECTED TO OPERATION.

No.	Age.	Sex.	Reported by	Splenectomy	Result.	Spleen.	Other Organs.	Symptom.	Classification of Growth.
21	....	....	Heinricius.	Enucleated growth by Heinricius.	Death seventh day.	Pedunculated fibrosarcoma arising from spleen. Weight, 500 grams.	No metastasis.	None except as manifested through presence of growth.	Primary fibrosarcoma.
22	54	M.	Flothmann.	Splenectomy.	Death fifty hours after the operation from symptoms of acute anemia.	Splenic tumor weighed four pounds and permeated by innumerable small growths, largest size of hazel-nut.	Extensive adhesions. Growth size of fist to omentum.	Not given.	Primary lymphosarcoma.
23	51	....	Krylow.	Splenectomy by Krylow.	Death followed four hours after operation from acute anemia.	Spleen and tumor weighed eight and a half pounds.	Extensive adhesions, involving pancreas and stomach.	None except presence of growth.	Primary small round-celled sarcoma.
24	36	M.	Warren, 1901.	Splenectomy by J. C. Warren. A portion of spleen left attached to stomach. Part of pancreas removed.	Death sixth day after operation of general peritonitis, pleuritis, and streptococcus septicaemia.	Size of growth that of two fists.	Extensive adhesions to pancreas and stomach.	No symptoms except presence of growth in left hypochondriac region, and loss of weight.	Primary small round-celled sarcoma.
25	43	F.	Von Hacker.	Splenectomy by Billroth.	Recovery. Died six months later from recurrence.	Spleen and growth weighed 450 grams and measured 25 by 18 centimetres.	No adhesions on convex surface. Omentum and loops of intestine adherent at concave surface. Four centimetres of spleen removed with growth.	For seven years had noticed growth size of two fists in left hypochondriac region. Rapid growth last two years. Marked pain.	Primary lymphosarcoma.
26	....	....	Kocher.	Splenectomy by Kocher.	Recovery. Subsequent death from recurrence.	Spleen uniformly enlarged.	Metastasis liver and mesenteric lymph-nodes.	.....	Primary lymphosarcoma.

27	15	....	Jordan.	Splenectomy by Jordan.	Recovery and subsequent death by recurrence.	Sarcomatous growth in spleen metastasized into hilum.	Fourteen months previous to splenectomy an enlargement of submaxillary lymph-node removed, which was a lymphosarcoma.	Pain in splenic region and enlargement in same region.	Primary sarcoma.
28	14	M.	Herczel.	Splenectomy by Herczel.	Recovery. Subsequent history not.	Spleen and growth weighed 2456 grams and measured 26 by 19 centimetres. Sarcomatous growth structure size of apple.	No metastasis.	Presence of growth recognized only one week before the operation. No other symptoms recorded.	Primary rounded sarcoma.
29	29	F.	Wagner, 1894.	Splenectomy.	Recovery. No recurrence.	Weight, 1285 grams. Size, 19 by 9½ by 10 centimetres.	No adhesion and no metastasis.	Seven weeks after last confinement, which was normal, noticed growth in left hypochondriac region. No discomfort from it. Blood count normal.	Primary endothelial sarcoma. Bunting. Rounded sarcoma. Marchand.
30	31	F.	Fritch, reported by Asch.	Splenectomy by Fritch.	Recovery uneventful. Normal confinement eight months after operation. Died six and a half years after operation of cardiac lesion.	Weight of spleen and growth, 2 grams. Size, 22 by 14 by 10 centimetres.	No adhesion and no metastasis.	Severe pain for three or four months prior to operation. Pregnant five weeks. Tumor in left hypochondriac.	Primary lympho sarcoma.
31	37	F.	Simon.	Splenectomy by Garré.	Recovery. Condition of patient good at end of one year.	Spleen and growth weighed 1750 grams and measured 22 by 13.5 by 11 centimetres.	No adhesion and no metastasis.	None except some pain and the presence of the growth. Duration of growth not given.	Primary rounded sarcoma.
32	15	F.	Jepson and Albert.	Splenectomy by Jepson.	Recovery. Condition of patient good at end of ten months.	Spleen and tumor weighed 256 grams. Tumor weighed 190 grams and measured 9½ by 8½ by 7½ centimetres.	No adhesion and no metastasis.	None except those of presence of growth, which was recognized five months prior to operation.	Primary fibrosarcoma.